

# PATENT SPECIFICATION



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## COMPLETE SPECIFICATION

### DRAWINGS ATTACHED

#### Improvements in and relating to Apparatus for Cleaning Wire Ropes or Cables

I, DAVID GLADSTONE BALFOUR REEKIE, a British Subject, of "Netherby", Johnstone, Renfrewshire, Scotland, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention has reference to apparatus for cleaning wire ropes or cables, hereafter referred to as ropes.

Wire ropes require to be periodically lubricated and tend to become coated with a layer of oil or grease and dirt. This is particularly the case with ropes employed in mines. It is necessary that such oil or grease and dirt should be removed as otherwise the lubricant applied to the rope will not penetrate therethrough but will lie on the surface.

The invention has therefore for its primary object to provide an improved apparatus for removing the oil or grease and dirt adhering to the rope.

According to the present invention an apparatus for cleaning wire ropes comprises two ligament anchoring members positioned at a spaced distance apart and through which the rope to be cleaned can travel, a series of ligaments anchored at their ends to the two anchoring members so as to encompass the rope, one of said members being capable of a partial rotary movement relative to the other so that the ligaments then extend in helical fashion to bear on the rope, means to lock the first member in its adjusted position, means to so support the said members that they, together with the ligaments, will rotate when a rope is passed therethrough due to the co-operation of the ligaments with the rope, and rope scraping devices secured to one of the anchoring elements so as to be rotated thereby, the construction and arrangement being such that when a rope is drawn through the apparatus the ligaments and their anchoring members rotate the scraping devices which serve to remove oil, grease and dirt from the rope and thereafter

the ligaments effect a further cleaning and burnishing of the rope to prepare it for lubrication.

The invention further consists in an apparatus as set forth in the preceding paragraph wherein the anchoring members are provided with gaps which enable the apparatus to be fitted to the rope so that the latter passes therethrough.

The invention also consists in an apparatus as above set forth wherein one of the anchoring members forms the end of a cylinder having arms carrying a sleeve in which is fitted a second ligament anchoring member, said sleeve having a gap therein and being provided with means by which it can be tightened on the sleeve anchoring member to hold the latter in any adjusted position.

The apparatus may be rotatably supported by an enclosing bearing adapted to be anchored to a fixture.

The apparatus may be combined with a lubricator by which oil is supplied to the cleaned rope and, where the lubricator is driven by a pump, the latter is driven by the rotating part of the apparatus.

A preferred embodiment of the invention will now be described with reference to the accompanying drawings wherein:—

Figure 1 is a sectional elevation of the improved apparatus for cleaning wire ropes;

Figure 2 is a section on the line 2-2 of Figure 1;

Figure 3 is an end view of Figure 1 looking to the left; and

Figure 4 is an end view of Figure 1 looking to the right.

The improved apparatus shown in the drawings comprises a ligament anchoring member 5 which forms the end of a cylinder 5a having axially extending diametrically opposite arms 6,6, the anchoring member having a central opening 7. Said arms 6 at their other ends carry a sleeve 8 in which is fitted the flange 9 of a second ligament

anchoring member 10 having a central opening 11. The two anchoring members and also the sleeve have aligned gaps 12 in the sides thereof to permit of the apparatus being 5 fitted to a rope so that the latter extends therethrough. Further each anchoring member has a series of circumferentially arranged holes 13, see Figure 1, with semi-spherical seats. Seated on the seats so as to be capable 10 of a self-adjusting movement are semi-spherical nuts 15 through which are threaded the ends of the ligaments 16, which ends are screw-threaded. The ligaments are in preference formed of spring steel wire of about 15 19 s.w.g. By means of the nuts the ligaments can be tightened or slackened off as may be found necessary to ensure that the ligaments are uniformly tensioned.

To enable the anchoring member 10 to be 20 rotated relative to the anchoring member 5 it is provided with a number of lugs 17 each having a tommy hole 18 for the insertion therein of a tommy bar 19. One or both arms 6 is, or are, also provided with a tommy hole 25 20 for the insertion of a second tommy bar 21.

The aforesaid sleeve 8 is provided on one side of the gap therein with a screw-threaded swivel pin 22 pivotally mounted between lugs 30 22a and adapted to fit in a slot formed in a lug 23 on the other side of the gap, a nut 24 screwed on the pin and bearing on the lug serving to reduce the gap sufficiently to lock the second anchoring member 10 in the 35 sleeve 8.

The anchoring member 5 is provided with a series of scrapers in the form of rods 25 having profiled ends 26 to bear on the rope and to engage in the helical grooves therein. 40 The scrapers may be chisel pointed to engage the grooves in the rope. Said rods are fitted in guides 27 which may be such that the rods are set at an angle of about 45° to the axis of anchoring members. The rods are urged 45 radially inwards by compression springs 28 inserted between collars 29 and fast on the rods and the opposed faces of guides therefor.

The apparatus is rotatably supported by a suitably anchored bearing 30 carrying a 50 thrust ring 31 on which bears a flange 32 carried by the apparatus, the flange, cylinder 5a and thrust ring having gaps therein for the insertion and withdrawal of the rope.

The apparatus is fitted to the rope to be 55 cleaned so that the rope extends axially therethrough, the gaps permitting of the introduction of the rope. There is thus no necessity to thread the rope through the apparatus and there is no necessity to make 60 the apparatus of hinged or detachable sections to permit of the introduction of the rope therein.

By means of tommy bars inserted in the aforesaid tommy holes 18 and 20 the liga- 65 ment anchoring member 10 is given a partial

rotary movement relative to the ligament anchoring member 5 and by this means the ligaments 16 are caused to assume a helical formation and to engage in the grooves of the rope. The sleeve 8 enclosing the flange 9 70 is then tightened by means of the nut 24 screwed on the swivel pin 22 and by this means the two ligament anchoring members are retained in the adjusted position wherein the ligaments fit into the grooves in the rope. 75

When the rope is drawn through the apparatus the latter partakes of a rotary movement due to the co-operation of the ligaments and grooves.

The scrapers fitted on the end of the appa- 80 ratus serve to effect a preliminary cleaning of the rope. Those scrapers are rotated, not by their co-operation with the rope, but by the rotating anchoring members and the ligaments. In consequence the scrapers do not 85 act harshly on the rope which is not worn thereby. Further there is little wear of the scrapers.

Further cleaning of the rope and burnishing thereof is effected by means of the liga- 90 ments. Where they rise out of the grooves the ligaments bear on and clean the surface of the rope. The ejected matter drops through the openings between the arms 6.

The improved apparatus is suitable for 95 cleaning ropes of a range of diameters, within limits, and is suitable for ropes having either right hand or left hand lay. Further it is suitable for cleaning various constructions of ropes having helical grooves which cannot 100 be satisfactorily cleaned by known constructions of rope scrapers.

In a development of the invention the apparatus comprises the combination of a rope cleaning apparatus as above set forth 105 with a pressure lubricator in the form of an outer casing to which lubricant is supplied under pressure from an external source and which contains an oil seal through which the rope is passed. Said casing is bolted to the 110 ligament anchoring member 10 which is provided with bolt holes 33 for this purpose. The lubricator rotates in unison with the ligaments and anchoring members therefor.

In an alternative arrangement the lubricator incorporates a rotary pump by which 115 lubricant is supplied to the rope under pressure, the pump rotor being coupled to the rope cleaning apparatus so as to be rotated thereby. The lubricator is conveniently constructed as set forth in my co-pending Patent 120 Application No. 790551 dated 28th January, 1955.

#### WHAT I CLAIM IS:

1. An apparatus for cleaning wire ropes 125 comprising two ligament anchoring members positioned at a spaced distance apart and through which the rope to be cleaned can travel, a series of ligaments anchored at their ends to the two anchoring members so as to 130

encompass the rope, one of said members being capable of a partial rotary movement relative to the other so that the ligaments then extend in helical fashion to bear on the rope, means to lock the first member in its adjusted position, means to so support the said members that they, together with the ligaments, will rotate when a rope is passed therethrough due to the co-operation of the ligaments with the rope, and rope scraping devices secured to one of the anchoring members so as to be rotated thereby, the construction and arrangement being such that when a rope is drawn through the apparatus the ligaments and their anchoring members rotate the scraping devices which serve to remove oil, grease and dirt from the rope and thereafter the ligaments effect a further cleaning and burnishing of the rope to prepare it for lubrication.

2. An apparatus as claimed in Claim 1 wherein the anchoring members are provided with gaps which enable the apparatus to be fitted to the rope so that the latter passes therethrough.

3. An apparatus as claimed in either of the preceding claims wherein one of the

anchoring members forms the end of a cylinder having arms carrying a sleeve in which is fitted a second ligament anchoring member, said sleeve having a gap therein and being provided with means by which it can be tightened on the sleeve anchoring member to hold the latter in any adjusted position.

4. An apparatus as claimed in any one of the preceding claims rotatably supported by an enclosing bearing adapted to be anchored to a fixture.

5. An apparatus as claimed in any one of the preceding claims having combined therewith a lubricator by which oil is supplied to the cleaned rope.

6. An apparatus as claimed in Claim 5 wherein the lubricator is provided with a pump driven by the rotating part of the apparatus.

7. An apparatus for the purpose set forth substantially as herein described and shown in the accompanying drawings.

MARKS & CLERK

#### PROVISIONAL SPECIFICATION

#### Improvements in and relating to Apparatus for Cleaning Wire Ropes or Cables

I, DAVID GLADSTONE BALFOUR REEKIE, a British Subject, of "Netherby", Johnstone, Renfrewshire, Scotland, do hereby declare this invention to be described in the following statement:—

This invention has reference to apparatus for cleaning wire ropes or cables, hereafter referred to as ropes.

Wire ropes require to be periodically lubricated and tend to become coated with a layer of oil or grease and dirt. This is particularly the case with ropes employed in mines. It is necessary that such oil or grease and dirt should be removed as otherwise the lubricant applied to the rope will not penetrate therethrough but will lie on the surface.

The invention has therefore for its primary object to provide an improved apparatus for removing the oil or grease and dirt adhering to the rope.

A further object of the invention is to provide an improved apparatus by which the oil or grease and dirt adhering to the rope will be removed therefrom and thereafter lubricant applied under pressure to the rope.

According to the present invention an apparatus for cleaning wire ropes comprises two ligament anchoring members positioned at a spaced distance apart and through which the cable to be cleaned can travel, a series of ligaments anchored at their ends to the two anchoring members so as to encompass the rope, means whereby one of said members

can be given a partial rotary movement relative to the other so that the ligaments then extend in helical fashion to bear on the rope and also to engage with the helical recesses on the surface thereof, means to lock said member in its adjusted position and means to so support the said members that they, together with the ligaments, will rotate when a rope is passed therethrough due to the co-operation of the ligaments with the helical recesses on the surface of the rope, such co-operation resulting in the ligaments then serving to remove the oil, grease and dirt from the surface of the rope and from the recesses thereof.

The invention further consists in an apparatus as set forth in the preceding paragraph wherein the anchoring members are provided with gaps which enable the apparatus to be fitted to the rope so that the latter passes therethrough.

The invention also consists in an apparatus as above set forth wherein one of the anchoring members forms the end of a frame which carries a bearing in which is fitted a bush which constitutes the other anchoring member, said bearing having a gap therein and being provided with means by which it can be tightened on the bush to hold the latter in any adjusted position.

Where the apparatus is used independently of a lubricator the frame may be rotatably supported by an enclosing bearing anchored

to a fixture. When used in combination with a lubricator the said frame is coupled to or is adapted to be coupled to and supported by either a rotary oil seal of the lubricator or the rotor of a rotary pump embodied in the lubricator, co-operation of the ligaments with the rope rotating the frame and therefore the seal or pump rotor.

The frame is preferably open at the sides thereof so that the matter dislodged by the ligaments from the rope can pass there-through.

According to one embodiment of the invention the improved apparatus comprises a ligament anchoring member which forms the end of a frame formed by two arms, the anchoring member having a central opening. Said arms have formed integral therewith a bearing which houses a bush. The bush constitutes a second ligament anchoring member. The two anchoring members and also the bearing have gaps in the sides thereof to permit of the apparatus being fitted to a rope so that the latter extends therethrough. Further each has a series of circumferentially arranged holes in which are fitted bushes with semi-spherical seats. Fitted in said bushes so as to be capable of a self-adjusting movement are semi-spherical nuts through which are threaded the ends of the ligaments, which ends are screw-threaded. The ligaments are in preference formed of music spring steel of about 19 S.W.G.

To enable the bush forming one of the anchoring members to be rotated in its bearing it is provided with a number of lugs each having a tommy hole for the insertion therein of a tommy bar. One or both arms of the frame is, or are, also provided with a tommy hole for the insertion of a second tommy bar.

The aforesaid bearing is provided with a screw-threaded swivel pin mounted on one side of the gap and adapted to fit in a slot formed in a lug on the other side of the gap, a nut screwed on the pin and bearing on the lug serving to reduce the gap sufficiently to lock the bush therein.

The end anchoring member may be provided with a series of scrapers in the form of rods having chisel pointed ends to bear on the rope and to engage in the helical recesses therein. Said rods are fitted in guides which may be such that the rods are set at an angle of about  $45^\circ$  to the axis of anchoring members. The rods are urged radially inwards by compression springs inserted between collars fast on the rods and the opposed faces of guides therefor. The frame is rotatably supported by a suitably anchored bearing carrying a thrust ring on which bears a flange carried by the frame, the flange, bearing and thrust ring having gaps therein.

The apparatus is fitted to the rope to be cleaned the gaps provided in the ligament

anchoring members, in the supporting bearing flange and in the bearing carrying the rotatably adjustable ligament anchoring member permitting of this. There is thus no necessity to thread the cable through the apparatus and there is no necessity to make the apparatus of hinged or detachable sections to permit of the introduction of the rope therein.

By means of tommy bars inserted in the aforesaid tommy holes the bush is given a partial rotary movement relative to the frame and by this means the ligaments are caused to assume a helical formation and to engage in the recesses of the rope. The bearing enclosing the bush is then tightened on the bush by means of the nut screwed on the swivel pin and by this means the two ligaments anchoring members are retained in the adjusted position wherein the ligaments fit into the recesses in the rope.

When the rope is drawn through the apparatus the latter partakes of a rotary movement due to the co-operation of the ligaments and grooves so that the ligaments remain in the grooves and eject the oil, grease and dirt lying therein. Further the ligaments, where they rise out of the recesses, bear on and clean the surface of the rope. The ejected matter drops through the openings between the arms of the frame.

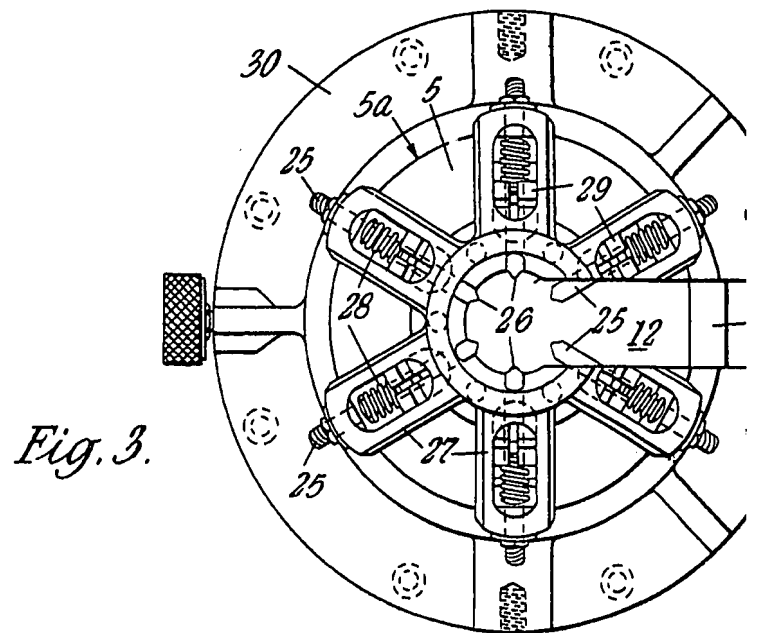
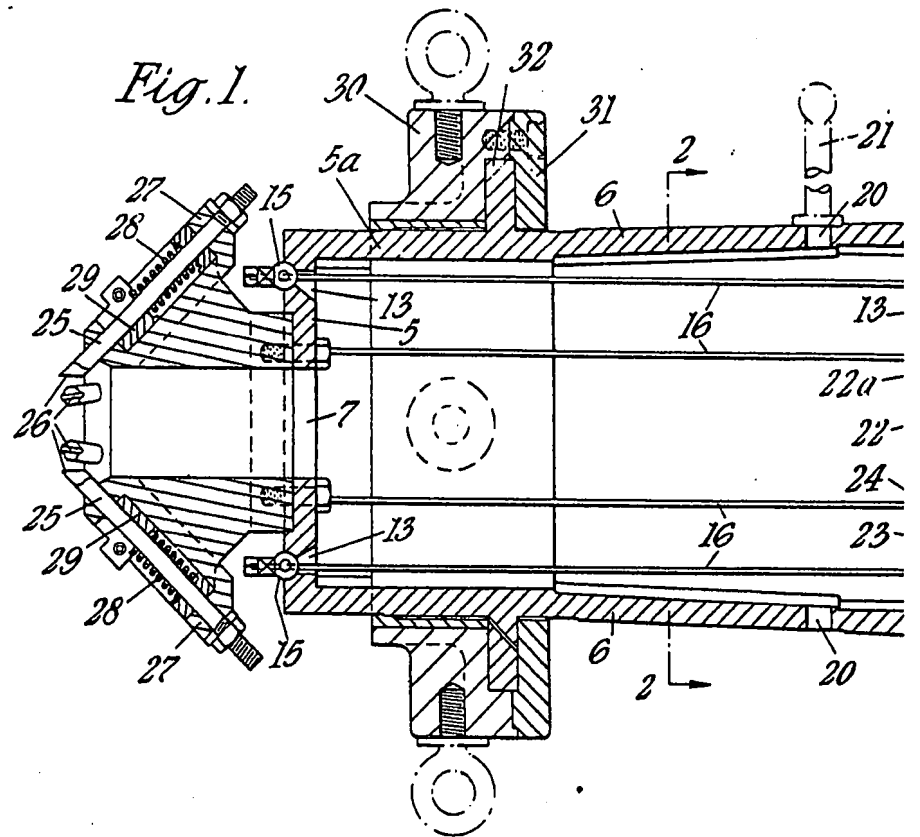
The scrapers fitted on the ends of the apparatus serve to effect a preliminary cleaning of the rope.

The improved apparatus is suitable for cleaning ropes of a range of diameters, within limits, and is suitable for ropes having either right hand or left hand lay. Further it is suitable for cleaning ropes of various constructions including locked-coil ropes which cannot be satisfactorily cleaned by known constructions of rope scrapers.

In another form of the invention the apparatus comprises the combination of a rope cleaning apparatus and a pressure lubricator in the form of an outer casing to which lubricant is supplied under pressure from an external source and which contains an oil seal through which the rope is passed. The frame of the rope cleaning apparatus is provided with sectors which are bolted to the oil seal so that the latter rotates in unison with the ligaments and anchoring members therefor.

In an alternative arrangement the lubricator incorporates a rotary pump by which lubricant is supplied to the rope under pressure, the pump rotor being coupled to the frame of the rope cleaning apparatus so as to be rotated thereby. The lubricator is conveniently constructed as set forth in my co-pending Patent Application No. 2673 dated 28th January, 1955.

MARKS & CLERK.



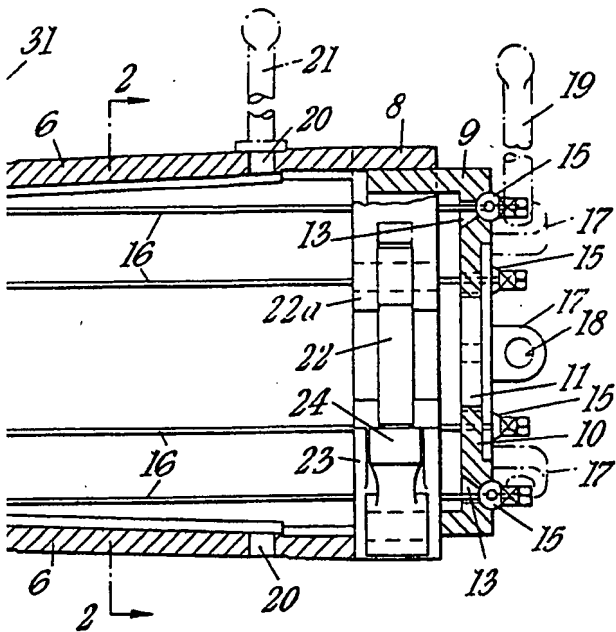


Fig. 2.

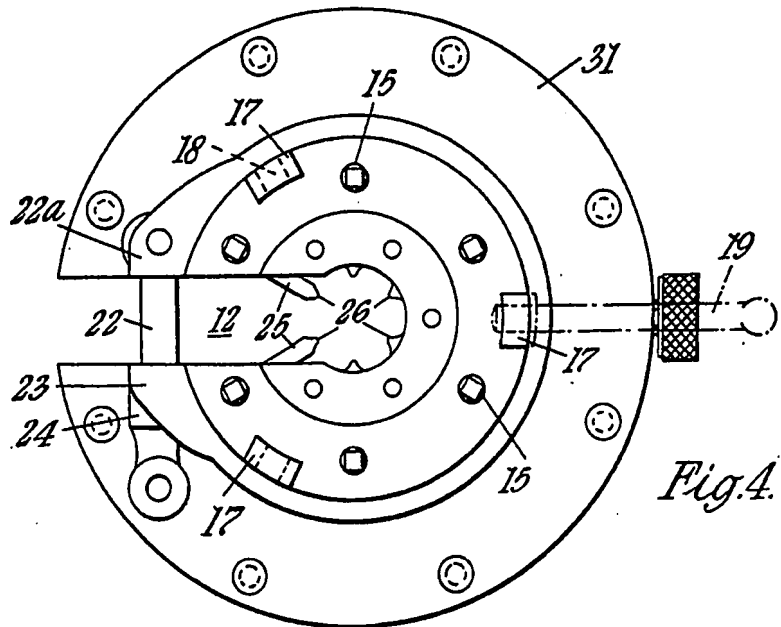
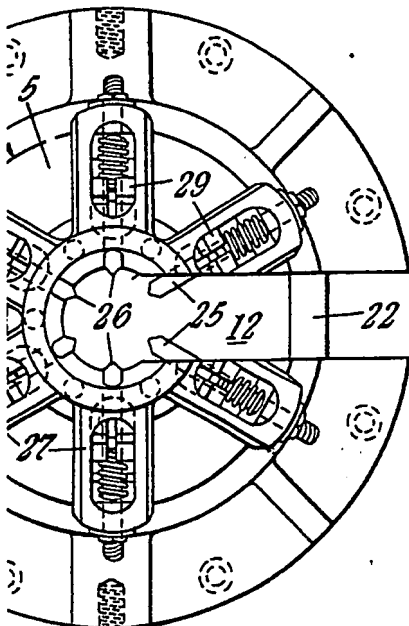
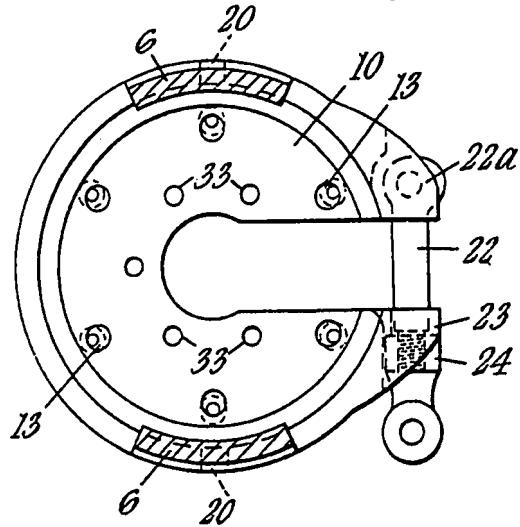


Fig. 4.

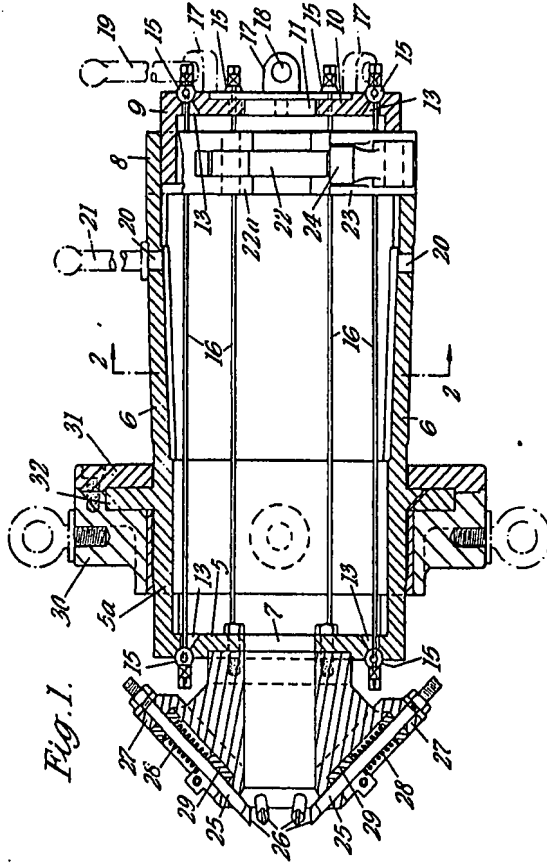


Fig. 1.

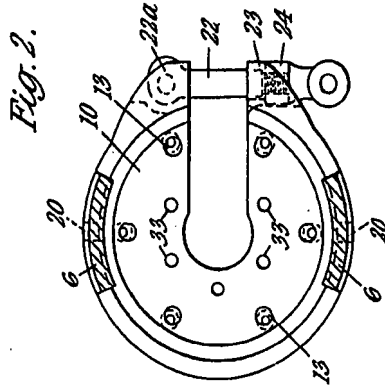


Fig. 2.

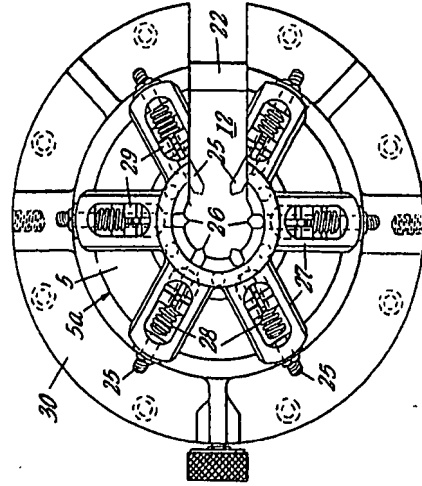


Fig. 3.

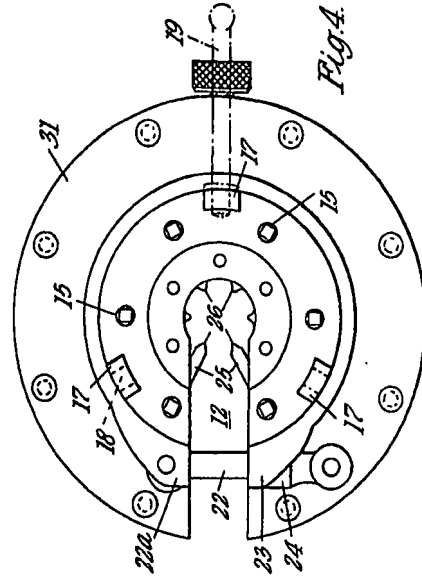


Fig. 4.